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Design and setup of a wing model in the Minimum-Turbulence-Level wind tunnel[1] FERMIN MALLOR, AGASTYA PARIKH, NARGES TABATABAEI, SimEx/FLOW, KTH Engineering Mechanics, MAJID HAJIPOUR, Sharif University of Technology, EDA DOGAN, RICARDO VINUESA, RAMIS ÖRLÜ, PHILIPP SCHLATTER, SimEx/FLOW, KTH Engineering Mechanics —
A reinforced fiber-glass model of a NACA 4412 wing profile is designed and set-up in the Minimum-Turbulence-Level (MTL) wind-tunnel facility at KTH (Sweden), aiming to complement and extend the high-fidelity numerical work performed by our research group on the same airfoil, including DNS and LES. The experiments includepressure scans, wake characterizations and boundary layer measurements by means of hot-wire anemometry at selected angles of attack (AoA, from 0 up to stall) and chord Reynolds numbers in the range 200k-2000k. In the present work the data is compared both to the aforementioned reference high-fidelity data and $k-\omega$ SST RANS simulations in which the wing is placed in a virtual wind-tunnel. The preliminary results show an excellent agreement with the reference numerical data, however, the effective angle of attack of the wing is affected by the interference of the test section, specially at high AoA, affecting the flow-separation position. Apart from creating an extensive statistical database for both the boundary-layer and wake flow, the spanwise coherence of the airfoil at different conditions (both attached and separated flow is investigated. This is crucial in order to determine the minimum requirements that high-fidelity simulations should have.

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